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THE MINING OF GILSONITE IN UTAH[1]

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HISTORY[3]

Gilsonite was discovered in the Ashley Valley in the Uintah Basin, Utah, several years after the first white men settled in the valley in 1878. The settlers discovered veins of a brilliant black substance in various parts of the basin. At first this substance was thought to be a variety of coal. When burned, however, it gave off large quantities of dense black smoke with a peculiar odor and instead of reducing to ashes the material melted and drew out into tarlike threads.

The first discovery was probably made in 1862 at what was then called Culmer vein, several miles south of the present site of the town of Myton in Duchesne County. Soon the Pariette mine was developed and the ore hauled to Price, Utah, the nearest railroad point.

Several years after opening the Culmer mine, a study of the substance was made by Professor W. P. Parker. He discovered that it was a member of the asphalt group and, as it was discovered on the Uintah Indian Reservation, he called it "Uintaite."

Samuel H. Gilson and Bert Seabolt became interested in these deposits and the former spent many years in his efforts to find a market for the Uintaite. His enthusiasm was regarded as more or less wasted by the people of the vicinity and the term "gilsonite" was locally applied to the Uintaite. When Gilson's efforts finally developed a market the name gilsonite had become firmly attached to this substance and it is now so known throughout the world.

Capital was obtained finally and filings were made on the Duchesne vein about 3-1/2 miles east of Fort Duchesne. Lands in this vicinity were then on the Indian Reservation and it was not until 1888 that "The Strip" of 7,000 acres was opened for entry. The St. Louis mine was developed and for many years this was the principal source of gilsonite. The ore was hauled 75 miles to Price, Utah.

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[3] - Bulletin 4 of the Industrial Commission of Utah.

Mining was necessarily done rather crudely but enough ore was produced to supply the small demand and work was continued without interruption until 1893 when the explosive nature of gilsonite dust was accidentally discovered when some of the dust was ignited by candles. Several miners were injured, one fatally, and so much damage done to the mine that operations were not resumed until the following year. A few months later there was a second explosion, killing two men and setting fire to the ore in the mine. After raging unchecked for 8 days the fire was finally smothered and the mine again operated.

Meanwhile, many larger veins in the eastern part of the basin had been discovered, and in the nineties the demand for gilsonite had increased so much that ore was hauled as far as 125 miles to the railroad.

About 1900 the St. Louis Co. was secured by the Barber Asphalt Paving Co of Philadelphia and reorganized under the name of the Gilson Asphaltum Co.. The Indian lands were thrown open and a wild scramble for gilsonite veins ensued. Owing to the expense of developing these properties few individuals were able to finance them and practically all of the land fell into the control of a few companies.

In 1902 the demand for gilsonite was so great that better, quicker, and more dependable methods of placing gilsonite on the market became necessary. The Black Dragon vein was developed and by 1904 enough ore was proved to warrant the construction by the Gilson Asphaltum Co. of a railway connecting the Dragon mine with the Denver and Rio Grande Railroad at Mack, Colo. and named the Uintah Railway.

The Uintah Railway is 55 miles long and is a marvel of engineering with very steep grades and sharp curves. It crosses the Book Cliffs at Baxter Pass, an elevation of 8437 feet. The trains actually travel 24 miles between points only 6 miles distant by air line; 3 and 4 per cent grades abound and there are several miles of 5 per cent grade and an unbroken stretch of 7-1/2 per cent grade. The shortest curves are 66°. The road is narrow-gauge and Shay engines haul four cars over the mountain. Recently the largest Mallet engine ever built for narrow-gauge service was secured and it hauls twice the number of cars at a greater speed than that of the Shay engines.

EXPLOSION IN DRAGON MINE

In spite of every precaution there was an explosion on February 12, 1908 Two men were killed; thousands of dollars worth of damage resulted, the mine became practically a furnace and all of the lower workings were filled with melted gilsonite which solidified. Fourteen months later the bodies of the two victims were recovered and operations resumed. The fire was not completely extinguished and continued to smolder for many months with occasional periods of increased intensity during which the miners would become panic stricken and most of them would leave. In November 1910 flames again broke out but all of the miners were brought to the surface safely.

The fire was extinguished and the mine placed in operation within a few months. Mining under these conditions was so dangerous however that in the spring of 1911 the property was abandoned and after considerable prospecting a site was chosen for a new mine on the Rainbow vein 8 miles to the northwest.

During the summer the Uintah Railway was extended 9 miles along Evacuation Creek and a new terminus built at Watson. A 4-mile branch, climbing 850 feet and requiring a 5 per cent grade most of the way, was run to the new mine at Rainbow.

PROPERTIES AND OCCURRENCE OF GILSONITE

Gilsonite occurs in the veins in a solid homogeneous mass and breaks with a conchoidal fracture. Even in the minutest pieces the brilliant fracture is preserved. Long exposure to the weather causes it to lose this brilliant black luster and it becomes dull and black. Occasionally it has a fine columnar structure at right angles to the walls. This is called "pencilated" ore and is frequently found on both sides of the vein. The veins outcrop on hilltips but elsewhere the ore is covered with 15 feet or more of soil.

The surface ore melts at about 400° and is used principally as a saturant of felt in the manufacture of roof and floor coverings. It is generally designated as White Label ore and with increasing depth it gradually becomes better in grade and is termed "select" grade about 50 feet beneath the surface at the Rainbow mine; but in places north of the White River "select" material is not found until a depth of 300 to 500 feet is reached. Select ore will melt at 275° F. and is used in the manufacture of high-grade paints, varnishes, and electric insulation. Although gilsonite lacks any elastic properties, it makes a varnish whose elasticity is remarkable. A thin piece of tin coated with good gilsonite varnish may be bent repeatedly without the coating being cracked.

Gilsonite is closely related to wurtzilite or elaterite and to ozocerite which is also found in the Uintah Basin. A kindred hydrocarbon, grahamite, is found in Oklahoma. Gilsonite is a black tarrylike substance with a brilliant luster. Its specific gravity is 1.035, its hardness is 2, and the streak on a porcelain plate is brown. It is exceedingly brittle and during mining gives off clouds of chocolate brown dust which softens under the heat of the body and is very penetrating to the skin. It is insoluble in water and is removed from the body with difficulty. It is not affected by acids but is soluble in alcohol, turpentine, carbon bisulphite, heavy oils, and fats.

Its average composition and thermal value are:

Composition of Gilsonite

	Per cent
Carbon	88.3
Hydrogen	9.96
Sulphur	1.32
Ash	0.10
	99.68

Thermal Value

Calories	9,650
B.t.u.	17,370

EXTENT OF DEPOSIT

The Uintah Basin is approximately 170 miles from east to west and 100 miles from north to south. It is bounded on the west by the Wasatch Mountains and extends into Colorado about 50 miles in the direction of Meeker. On the north it is bounded by the Uinta Mountains and on the south by the Book Cliffs. This area of some 15,000 square miles contains a storehouse of asphaltum, asphaltic sandstone, and oil shale so large that expressed in figures it is staggering. The basin is a syncline formed by the upbending of the strata against the Uinta Mountains and is cut through the center by the deep gorge of the Green River which flows towards the south.

By far the greatest amount of gilsonite is found north of the White River where the Lower Uinta measures show less erosion. Three large and nearly parallel veins extend across the country in a N. 60° W. direction with a dip of nearly 90°. The Cowboy vein is the largest and has a maximum width of 18 feet for about 2 miles north of White River. This vein rapidly becomes narrower in both directions but is at least 10 feet wide for 3 or 4 miles and over 6 feet wide for several miles north of White River.

There are numerous veins in the basin and when one considers that 1 mile of the Cowboy vein in the widest place contains about 316,800 tons for each 100 feet in depth, the supply of gilsonite seems almost inexhaustible.

THEORY OF ORIGIN

Various theories have been advanced as to the formation of these veins. The claim that the source was in some overlying strata is without foundation in view of recent investigations. The most plausible theory appears to be that the formation of this great synclinal basin resulted in gigantic cracks in the brittle and nonelastic sandstone measures of the Uinta formation with enough heat to distill the oily matter in these carbonaceous measures from the underlying Green River shales.

USES OF GILSONITE

The higher grades of gilsonite are made into varnish, paint, electrical insulation, and inks for rotogravure sections of newspapers. The intermediate grade is used for such articles as telephone mouthpieces, switch handles, and knobs and buttons of various kinds. The poorer grade is used in the saturation of felt.

The ore found near the surface contains foreign matter, mostly silica, which renders it unfit for the best trade. It was formerly the practice to leave in the ground as pillars much of this surface ore, but recently the use of this quality of gilsonite for the saturation of felt has increased until it comprises one-half of the gilsonite ore shipped. The growth of foreign use of gilsonite has increased until one-fifth of the ore mined is consumed outside of the United States. The demand for gilsonite in England, France, Germany, Italy, Holland, Belgium, and Japan is steadily increasing.

A very small amount of foreign matter in a shipment of select ore will render it unsuitable for varnish so that the utmost care must be taken to prevent chips of rock or grains of sand from getting into the high-grade ore.

OPERATING COMPANIES

At present there are three companies operating in the Watson, Utah, district. The Gilson Asphaltum Co., a subsidiary of the Barber Asphalt Co., operates the Rainbow mine with about 40 men for about 300 days a year. The American Asphalt Association is operating the Country Boy and Rector mines on the Dragon vein with approximately 50 men. Their output is considerably less than that of the Rainbow mine on account of poorer mining conditions and the necessity of trucking ore 3 to 5 miles. This company also mines small amounts of ore from holdings on the Cowboy vein. The Utah Gilsonite Co. operating the Little Emma mine on the Uinta vein, employs about 10 men, transporting their ore by truck to Craig, Colo. The combined output of all the companies is about 130 tons daily.

MINING METHODS

The method of mining used at Rainbow will be described as it is characteristic of that used at all gilsonite workings.

The mining of gilsonite unlike that of coal or other ores requires no elaborate surface plants for preparation. The gilsonite ore does not have to be prepared and as it is sacked and made ready for shipment in the mine the only loading equipment necessary is a platform from which the sacks of ore are transferred from the mine car to railroad cars.

The ore outcrops at the surface where mining is started and progresses inward and downward, all of the ore of the vein being removed. In working, a system of slopes and benches is used.

At the "Thimble Rock" operation of the Rainbow mine, a small gasoline hoist is employed to hoist the sacked ore to the tramway level. The hoist is so located and the sheave wheels so arranged that ore can be hoisted from any of the different shafts by moving the cable from one wheel to another. At the other operations, gasoline tractor-hoists are employed.

Due to the highly inflammable nature of gilsonite no attempt has been made to use explosives in mining. The ore is very brittle and a sharp pick can be driven into it easily. Trenches about 18 inches wide are dug along each side wall, thus releasing the pressure on the center of the mass so that the ore expands and breaks out of itself or can easily be picked out. The miners who dig the ore also do the sacking and place the sacks, three at a time, on the hoisting cable. The filled sacks weigh about 225 pounds and are sewed with different colored twine to distinguish the various grades. The gilsonite for foreign trade is shipped in double sacks. All mining is done by contract and each man mines about 5 tons receiving about $1.50 for each ton mined.

The walls are smooth and require little timbering except against the flaking off of small pieces. Occasionally, small veins of gilsonite parallel to the main vein expand after mining and loosen large sections of the wall, requiring much timbering to hold them in place. Horses or large pieces of country rock which may be attached to one or both walls or may be held in place by the ore are sometimes found in the vein. These are usually held in place by a pillar of ore below them, and as gilsonite will readily expand and fall it is essential that it be supported by timbers and lagging. The timbers used are about 8 inches in diameter and are hitched into the wall on one side and wedged on the other.

As the workings are open to the surface the use of lights is not necessary; the miners become accustomed to the semidarkness and are able to work without artificial light.

Manways or ladderways are used to enter the different workings. Substantial ladders with landings every 12 feet are guarded by enclosures of heavy wire netting to prevent falling. The mine workings are well protected against falling material from the surface by means of wire netting placed along the tramway level.

The Rainbow mine is the only gilsonite property with direct railroad connections. Also, it has always been the largest producer of gilsonite, about 75 per cent of all gilsonite produced coming from this mine.

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